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ICS 13.100
C 65
Record No.: 64176-2018

AQ

Professional Standard of the People's Republic of China

AQ 2001-2018

Replaces AQ 2001-2004

Safety regulations for steel-making

炼钢安全规程

(English Translation)

Issue date: 2018-05-22 Implementation date: 2018-12-01

Issued by the Ministry of Emergency Management of the People's Republic of China

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Foreword

ChinaStandards.net is in charge of this English translation. In case of any doubt about the English translation, the Chinese original shall be considered authoritative.

All technical contents of this standard are compulsory.

This standard is developed in accordance with the rules given in GB/T 1.1-2009.

This standard replaces AQ 2001-2004 *Safety regulations for steel-making*. The following main technical changes have been made with respect to AQ 2001-2004:

——the structural order of the standard has been adjusted;

——the relevant safety requirements of GB/T 33000 have been added;

——the requirements for safety detection and monitoring measures of converter gas area have been added;

——the requirement that the personnel gathering places shall not be within the influence range of lifting high-temperature liquid metal has been added;

——some requirements for arrangement of oil supply station and acetylene gas station have been deleted;

——the grounding protection requirements for devices such as gas purification stations have been added;

——the requirement that the crane for lifting oxygen lance and sub-lance in the high-rise frame of converter shall be operated by wireless remote control and wire control operation board instead of the driver in the cab has been added; and

——the requirement that effective ventilation measures shall be taken when entering the space with nitrogen sealing equipment (e.g. silo) has been added.

This standard was proposed by the original Fourth Division of the State Administration of Work Safety.

This standard is under the jurisdiction of the Subcommittee on Metallurgical Nonferrous Safety of the National Technical Committee on Safety Production of Standardization Administration of China (SAC/TC 288/SC 8).

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Safety regulations for steel-making

1 Scope

This standard specifies the technical requirements for safety production of steel-making.

This standard is applicable to the design, equipment manufacturing, construction and installation, production and equipment overhaul of steel-making plant.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition (including any amendments) applies.

GB 2894	*Safety signs and guideline for the use*
GB 4053.1	*Safety requirements for fixed steel ladders and platform - Part 1: Steel vertical ladders*
GB 4053.2	*Safety requirements for fixed steel ladders and platform - Part 2: Steel inclined ladders*
GB 4053.3	*Safety requirements for fixed steel ladders and platform - Part 3: Industrial guardrails and steel platform*
GB 4387	*Safety regulation for railway and road transportation in plants of industrial enterprises*
GB/T 5082	*The commanding signal for lifting and moving*
GB 5768.2	*Road traffic signs and markings - Part 2: Road traffic signs*
GB 5768.3	*Road traffic signs and markings - Part 3: Road traffic markings*
GB/T 5972	*Cranes - Wire ropes - Care, maintenance, installation, examination and discard*
GB/T 6067.1	*Safety rules for lifting appliances - Part 1: General*
GB 6222	*Safety code for gas of industrial enterprises*
GB 6722	*Safety regulations for blasting*
GB 7231	*Basic identification colors and code indications and safety sign for industrial pipelines*
GB 14784	*Safety regulations of belt conveyor*
GB 16912	*Safety technical regulation for oxygen and relative gases produced with cryogenic method*
GB/T 20801.6	*Pressure piping code - Industrial piping - Part 6: Safeguarding*
GB 28664	*Emission standard of air pollutants for steel smelt industry*
GB/T 29639	*Guidelines for enterprises to develop emergency response plan for work place accidents*
GB/T 33000	*Guideline of China occupational safety and health management system*
GB 50016	*Code for fire protection design of buildings*

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GB 50030 *Code for design of oxygen station*
GB 50034 *Standard for lighting design of buildings*
GB 50057 *Code for design protection of structures against lightning*
GB 50058 *Code for design of electrical installations in explosive atmospheres*
GB 50140 *Code for design of extinguisher distribution in buildings*
GB 50184 *Code for acceptance of construction quality of industrial metallic piping*
GB 50235 *Code for construction of industrial metallic piping engineering*
GB 50236 *Code for construction of field equipment, industrial pipe welding engineering*
GB 50316 *Design code for industrial metallic piping*
GB 50683 *Code for construction of field equipment, industrial pipe welding engineering*
GB 50414 *Code of design on fire protection and prevention for iron & steel metallurgy enterprises*
GB 50439 *Code for design of steelmaking engineering*
GB 50603 *Code for design of general layout and transportation for iron & steel enterprise*
GBJ 22 *Specifications for the design of factory and mine roads*
GBZ/T 205 *Specification of prevention and control on occupational hazards in confined space*
DL 408 *Rules of safe operation in power industry*
TSG D0001 *Pressure pipe safety technology supervision regulation for industrial pressure pipe*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
shaft furnace
ultra-high power electric arc furnace with a shaft on its cover, where the scrap steel is preheated in the shaft by high-temperature waste gas discharged from the electric arc furnace

3.2
PLUS2000 furnace
ultra-high power electric arc furnace with a scrap steel basket rotating device, which preheats the scrap steel by its own high-temperature waste gas

3.3
CONSTEEL furnace
ultra-high power electric arc furnace in which scrap steel is continuously added through a conveyor belt and preheated by its own high-temperature waste gas

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3.4

Korfarc furnace

ultra-high power electric arc furnace with several oxygen lance burners and submerged tuyeres on the furnace wall, which saves electric energy by using chemical energy and post-combustion technology

3.5

vacuum degassing, VD

vacuum degassing device for molten steel, in which a ladle filled with molten steel is placed in a closed vacuum tank connected with a vacuum pump, argon gas is introduced from the bottom of the ladle to stir the molten steel, so that the molten steel undergoes degassing reaction in a vacuum state

3.6

vacuum oxygen decarburization, VOD

vacuum oxygen decarburization refining device mainly used for refining stainless steel, of which an oxygen lance is arranged on the vacuum tank cover of VD to blow oxygen to the molten steel surface in the vacuum tank, and the chromium-containing molten steel undergoes "decarburization and chromium preservation" refining in a vacuum state, which can also be used for smelting ultra-low carbon steel

3.7

composition adjustments by scaled argon bubbling with oxygen blowing, CAS-OB

device for heating molten steel in a ladle by utilizing oxidation heat generated by metal (aluminum) combustion, or for adjusting the composition of molten steel by adding alloy in immersion hood

3.8

injection refining-up temperature, IR-UT

device which can not only carry out injection desulphurization refining for molten steel under normal pressure, but also raise the temperature by blowing oxygen and adding aluminum, and of which, a powder spray gun is inserted into molten steel in the immersion hood, so as to spray desulfurizer into molten steel

3.9

ruhrstahl-heraeus process, RH

refining method for vacuum circulating degassing of molten steel, in which, two circulating tubes (immersion tubes) at the bottom of the vacuum chamber are inserted into molten steel to make the molten steel continuously flow into the vacuum chamber from the ascending tube (with argon as the lifting gas) following the principle of bubble pump, and then flow back to the ladle from the descending tube, thus forming a circulating flow

3.10

ruhrstahl-heraeusdegassr-top blowing, RH-TB

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method of refining ultra-low carbon steel and stainless steel by inserting an oxygen lance at the top of RH vacuum tank and blowing oxygen to molten steel for decarburization

3.11
ladle furnace, LF
device for blowing argon from the bottom of ladle under normal pressure and heating the molten steel by electric arc to refine molten steel and homogenize its composition and temperature

3.12
argon oxygen decarburization, AOD
decarburization refining furnace in which oxygen and argon (in different proportions) are blown into molten steel from the side of molten steel pool of converter, mainly used for smelting stainless steel

4 Safety management

4.1 The safety production management of steel-making enterprises shall meet the relevant requirements of GB/T 33000.

4.2 Safety facilities of constructed, extended and renovated projects shall be designed, constructed and put into production or use simultaneously with the main part of the project. Investment in safety facilities shall be incorporated into the budgetary estimate of the whole construction project. In the feasibility study stage of the project, an evaluation institution with corresponding qualification shall be entrusted to carry out safety pre-evaluation.

4.3 The preliminary design documents of the construction project shall include *Safety Facility Design*. The safety facility design shall run through the design of various specialties and be submitted for review according to relevant requirements.

4.4 The construction of the construction project shall be carried out according to the design. The change of safety facility shall be approved in writing by the design organization.

The concealed part of the project can be concealed only after being approved through checking and signing by the design organization, development organization, supervision organization and construction organization.

After the completion of the construction, the construction organization shall deliver the completion instructions and as-built drawings to the development organization.

4.5 The construction project, after being completed, shall be put into trial run before normal production or use.

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a) The trial run period shall not be less than 30d and not be greater than 180d at most;

b) After the completion of the safety facility of the project or the completion of the trial run, an eligible evaluation institution shall be entrusted to carry out safety acceptance evaluation;

c) After a project is completed and before it is put into production or use, the production and operation organization shall organize the completion acceptance of the safety facility and form a written report for future reference. Safety facility can be put into production and use only after passing the completion acceptance.

4.6 Steel-making enterprises shall establish a production safety management organization or allocate full-time safety production management personnel. The registered safety engineers shall be allocated to be responsible for safety production management.

4.7 Steel-making enterprises shall strengthen the safety management, monitoring and control of major hazard sources, establish and improve the safety management rules and regulations for major hazard sources, which shall include the following contents:

a) Various hazard sources existing in the organization shall be identified and subjected to classified management. Those constituting major hazard sources shall be registered and filed, regularly detected, evaluated and monitored, with obvious safety warning signs set at the site of major hazard sources;

b) An implementation plan for safety management and monitoring of major hazard sources shall be formulated.

4.8 Steel-making enterprises shall be equipped with on-line gas monitoring and protection facilities according to the relevant requirements of GB 6222, and shall set obvious safety warning signs in areas where gas is prone to leakage and accumulation.

4.9 Steel-making enterprises shall establish and improve their own responsibility systems for production safety, and formulate and improve their own rules, regulations and operating procedures for production safety. They shall also strictly implement the post duty shift system.

4.10 Special operation personnel and special equipment operators shall undergo special safety education and training, pass the examination and obtain operation qualification certificate before taking up their posts. The training, examination, certification and re-examination of the above personnel shall be carried out according to the relevant national requirements.

4.11 The personnel gathering places of steel-making enterprises, such as meeting room,

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activity room, rest room and locker room, shall be in safe places, and shall not be within the influence range of lifting high-temperature liquid metal.

4.12 Steel-making enterprises shall establish and improve the employment safety management system for dispatched workers, and strengthen the employment safety management and carry out unified safety education and training for them.

4.13 The corresponding safety technical measures shall be formulated for new processes, new technologies, new equipment and new materials; the relevant production personnel shall undergo special safety technical training and can take up their posts only after passing the examination.

4.14 Steel-making enterprises shall establish a regular inspection, maintenance and cleaning system for plant buildings and electromechanical equipment. An operation sign system shall be implemented for key posts as well as electrical, mechanical and other equipment.

4.15 Safety devices and protective facilities shall not be moved, dismantled or used for other purposes without authorization.

4.16 Steel-making enterprises shall establish an emergency rescue plan for major accidents such as leakage of molten iron, molten steel and liquid slag, gas poisoning, fire, explosion, electric shock and poison escape. The emergency plan shall be prepared according to the relevant requirements of GB/T 29639. Necessary emergency equipment such as gas detectors, protective masks, protective gloves, protective clothing, gas masks, respirators, eye bath, first-aid medicines and equipment shall be arranged in places prone to accidents, and emergency rescue drills for accidents shall be regularly carried out.

4.17 If the production, overhaul and maintenance operations of steel-making enterprises are outsourced, the contractor shall be informed of hazardous and harmful factors. A safety disclosure shall be made to and a safety agreement shall be reached with the contractor, whose safety qualification and safety measures shall be reviewed.

4.18 Warning signs shall be arranged in the strong electromagnetic radiation areas of steel-making enterprises, and personnel with pacemakers or metal implants in their bodies are prohibited from entering such areas.

4.19 Any casualty accident in a steel-making enterprise shall be reported, investigated and dealt with according to the relevant national requirements.

4.20 The operation in a confined space involving gas, nitrogen, etc. shall meet the requirements of the safety management of operation in confined space and those of GBZ/T 205, with ventilation first and then detection and operation.

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